Revision 2 of “Formation of the plasma sheet and (non-storm) ring current by solar and polar wind sources”, by T. E. Moore et al.

Response to Reviewer #2:

We thank the reviewer for the constructive comments on the remaining cosmetic issues, based upon which we have made the following improvements in the revised manuscript:

Minor Concerns:

1. Figure 6 was reworked to rationalize the coordinate axis ranges and improve the labels.

2. In figure 7, we switched two panels from polar wind for SBz to solar wind for NBz, since it seems that the main issue here is the solar wind and not the polar wind. We considered rescaling the figure, but concluded that the matter of interest is the degree to which the sampling exceeds a minimum requirement per cell. Therefore, we retained the saturation at the level of 100 particles. The detailed structure of sampling in excess of that is thought by our coauthors to be a distraction from the physical parameter results given in subsequent plots.

3. The inconsistency in solar wind density values was resolved.

4. We corrected the short title to include the (non-storm) qualifier, which was our intent. We don’t necessarily agree that one can equate closed drift paths with “full ring current”, since recent studies have called into question the idea that many particles are on closed drift paths during storm main phase, pointing out that this may only occur during the decay phase of storms [e.g., Liemohn et al., 2000]. We have resisted the temptation to switch terminology to “full” and “partial” ring current for this reason.

5. We do not agree that we have used either too course a grid or too few particles, at this point. However, we are culpable for miscommunication in that we underreported our grid size, contributing to confusion on this point (see discussion below).

Major concern:

The remaining major concern of the referee is based on the spatial resolution of our MHD simulation. Assessing the system volume at 2.6 million Re^3, covered by 50*32*24 = 38400 grid points, leads to 2600000/38400 or ~ 68 cubic Re per cell. This is judged to be too coarse for useful work, but our grid is non-uniform, unlike the grid of the simulation used for the Walker, Richard, and Peroomian studies discussed by the referee, as can be learned from our cited references to Slinker et al. 1995, and 1998.

This was exacerbated by a mistake on our part, in which we underreported our grid, based on a reference to an earlier version of the MHD code. In fact the grid is 50x48x64 (4x larger). But it is the non-uniformity of the grid that really makes these numbers workable.

For example, in the spherical shell for the inner boundary at r=3.2 Re to r=10 Re there are approximately 49000 grid points with an average volume per cell of 0.08 cubic Re.

For the shell out to r=15 Re, appx. 77000 points with avg. cell volume of 0.18 Re^3 and for the shell out to r=20 Re, 90000 grid points with volume about 0.35 Re^3.

Also relevant here is the box volume from -25 to 15 in x and -20 to 20 for y and z. This volume of 40*40*40 = 64000 Re^3 has about 103000 grid points with an average cell volume of 0.6 Re^3. This is the gridding that should be compared with other MHD models, and it has been shown to be adequate for global scale work.

Since this has been an issue, we added a reference to a paper in which the grid is visualized: Slinker, S.P., J.A. Fedder, J.M. Ruohoniemi, and J.G. Lyon, Global MHD simulation of the magnetosphere for November 24, 1996, JGR 106, 361-380, (2001).

In summary, we believe that this concern reflects a misunderstanding about the grid strategy used in our MHD simulation. We have added a paragraph on the specifics to insure that readers are not required to go to our references for this information.